MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2015/2016

PMT0101 – MATHEMATICS I

(Foundation in Information Technology)

15 October 2015
9:00 a.m. 11:00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 5 pages with **FIVE** questions.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided.
4. **No calculators are allowed**.

No calculators are allowed.
You are required to write proper steps.

ANSWER ALL QUESTIONS.

QUESTION 1 [10 marks]

(a) Simplify the expression and write your final expression as a fraction with no negative exponent.

$$\frac{3x^4y^{-3}}{(6x^3y)^2}$$ (2 marks)

(b) Rationalize the denominator and simplify.

$$\frac{6}{\sqrt{7}-2}$$ (2 marks)

(c) Perform the indicated operation and write the final result in the standard form $a+bi$.

$$\frac{2-i}{3-i}$$ (2 marks)

(d) Factor the polynomial.

$$27x^3+8$$ (2 marks)

(e) Simplify the expression and give the final answer as a single fraction.

$$\frac{7}{(x-2)(x-1)}-\frac{4}{(x-2)(x+2)}$$ (2 marks)

Continued .....

QUESTION 2 [10 marks]

(a) (i) Solve the quadratic equation $2x^2 + 5x - 7 = 0$.

(ii) Solve the inequality $(2x + 7)(x - 1) > 0$.
Give your final answer in interval notation.

(iii) Find the domain of the function $f(x) = \sqrt{\dfrac{1}{(2x+7)(x-1)}}$.
Give your final answer in interval notation.

(5 marks)

(b) Solve the equation $|8x + 1| = 8$.

(2 marks)

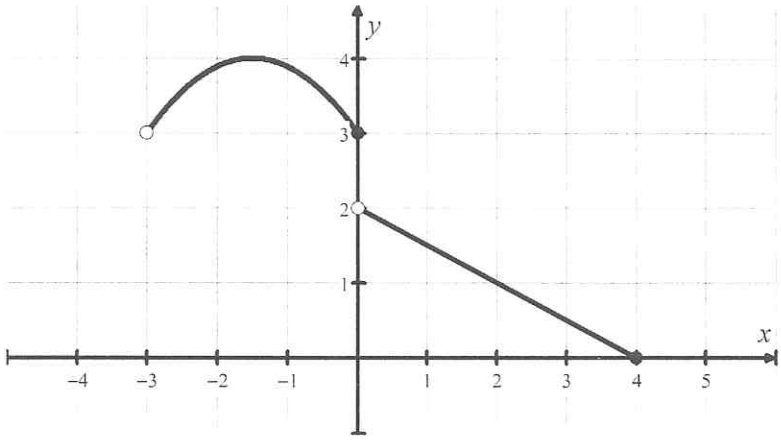
(c) Solve the equation $x = \sqrt{3x + 4}$. Remember to check your answers.

(3 marks)

Continued .....

QUESTION 3 [10 marks]

(a) The figure shows the graph of a function.
(*The axes are marked off in one-unit intervals.*)



(i) State the domain and the range of the function in interval notation.

(ii) State whether it is a one-to-one function.

(2 marks)

(b) Given the functions $f(x) = \sqrt{x+2}$ and $g(x) = \dfrac{1}{x+3}$, find

(i) $(f \circ g)(1)$, giving your final answer in the form $\dfrac{m}{n}$ where m and n are integers.

(ii) $f^{-1}(x)$, as a polynomial in x.

(3 marks)

(c) Consider the polynomial function $f(x) = -\dfrac{1}{2}(x-1)^2(x-3)^2(x+1)$.

(i) What is the **degree** of f?

(ii) Find **the zeros** of f **and their multiplicities**.

At each zero, determine whether the graph of f crosses or touches the x-axis.

(iii) Find the y-intercept of f.

(iv) Determine the end behavior of f.

(v) Sketch the graph of the function f. Show all its intercepts and its end behavior.

(5 marks)

Continued .....

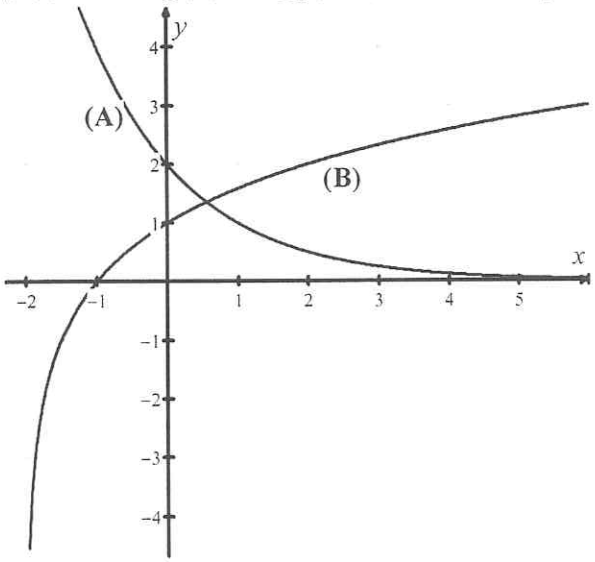
QUESTION 4 [10 marks]

(a) Solve the inequality $-7 \leq 3 - 2x < 11$, giving your final answer in interval notation.

(2 marks)

(b) The figure below shows the graphs of two functions selected from the list:

$f(x)=2^{-x+1}$, $g(x)=\log_2(x-1)$, $h(x)=\log_2(x+2)$, $p(x)=2^{x+1}$



(i) Write down the function whose graph is labelled (A).

(ii) Write down the function whose graph is labelled (B).

(2 marks)

(c) (i) Write $f(x)=x^2+4x+1$ in the standard form $(x-h)^2+k$ where h and k are some constants.

(ii) Determine the vertex and the y-intercept of the graph of $f(x)=x^2+4x+1$.

(iii) Sketch the graph of $y=x^2$ and the graph of $f(x)=x^2+4x+1$ on the same axes. Indicate clearly the vertex and y-intercept of the second graph.

(3 marks)

(d) Use long division to find the quotient and the remainder when the polynomial $3x^3+x^2+10x+1$ is divided by x^2+6.

You are required to state clearly what the quotient and the remainder are.

(3 marks)

Continued .....

QUESTION 5 [10 marks]

(a) Rewrite the sum $\sum_{k=2}^{5}(3k-1)$ without the sigma notation and then evaluate the sum.

(2 marks)

(b) Determine the common difference of the arithmetic sequence $10, 6, 2, -2, \ldots$
Then find the sum of the first 30 terms of the sequence.

(2 marks)

(c) Is the infinite geometric series

$$\frac{1}{2}-\frac{1}{3}+\frac{2}{9}-\frac{4}{27}+\cdots$$ convergent?

Give reason for your answer.
If the series is convergent, find its sum.

(3 marks)

(d) Find the slope of the straight line l_1 with equation $3x + 2y + 1 = 0$.
Then use it to obtain an equation for the line l_2 which passes through the point $(-1, 2)$ and is parallel to the line l_1 .
Finally present the equation in the general form $Ax + By + C = 0$.

(3 marks)

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